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NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS  
ERIKSON DAM MA 00195. (U) CORPS OF ENGINEERS WALTHAM MA  
NEW ENGLAND DIV DEC 79

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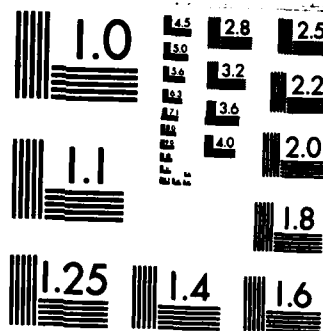
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ASSABET RIVER BASIN  
ACTON, MASSACHUSETTS

ERIKSON DAM  
MA 00195

**PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM**



DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
WALTHAM, MASS. 02154

DECEMBER 1979

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  Erikson Dam is a stone masonry overflow dam across Fort Pond Brook. The dam is a total of 52.8 feet long and a maximum of 16.7 feet high. The dam is considered to be in poor condition. Based on the Corps of Engineers' guidelines, the dam has been classified in the "small" size category and in the "significant" hazard category.		



DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
424 TRAPELO ROAD  
WALTHAM, MASSACHUSETTS 02154

REPLY TO  
ATTENTION OF  
NEDED

FEB 4 1980

Honorable Edward J. King  
Governor of the Commonwealth of  
Massachusetts  
State House  
Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the Erikson Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, Erikson Grain Mill, Inc., South Acton, Massachusetts.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely,

*Max B. Scheider*  
MAX B. SCHEIDER

Colonel, Corps of Engineers  
Division Engineer

Incl  
As stated

ERIKSON DAM

MA 00195

ASSABET RIVER BASIN  
ACTON, MASSACHUSETTS

PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION  
PROGRAM

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NATIONAL DAM INSPECTION  
PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No.: MA00195

Name of Dam: Erikson Dam

Town: Acton

County and State: Middlesex County, Massachusetts

Stream: Fort Pond Brook

Date of Inspection: September 18, 1979

Erikson Dam is a stone masonry overflow dam across Fort Pond Brook. The dam, which formerly provided storage for a sawmill, was constructed in 1848 of cut granite blocks, with a sloping upstream face and a vertical downstream face. The dam is a total of 52.8 feet long and a maximum of 16.7 feet high. The top of the dam, which is also the overflow weir, ranges from elevation (El) 191.4 to 194.9 at the left abutment. In addition, a small breach has been created in the top of the dam by removing one granite capstone. The breach, which acts as a lower-level spillway, is 4.3 feet wide, with the crest at El 190.3. Water flowing over the dam discharges directly into Fort Pond Brook. The right abutment of the dam is the fieldstone foundation wall of a former mill building. The left abutment ties into bedrock and the natural earth slope of the Fort Pond channel.

There is no outlet at the dam and no operating equipment for lowering the water level in the mill pond formed by the dam.

There are deficiencies which must be corrected to insure the continued performance of this dam. This conclusion is based on the visual inspection, a review of previous inspection reports and a review of operating and maintenance procedures.

ERIKSON DAM

The dam is considered to be in poor condition as a result of the following deficiencies: uncontrolled and extensive leakage through the unmortared masonry blocks of the dam; and the lack of a low-level outlet for lowering the water level in the pond in an emergency. The following additional deficiencies were observed at the site: stone blocks dislodged or removed from the top of the dam; lack of riprap or some form of slope protection on the left bank of the brook; heavy accumulation of debris in the downstream channel; trees and brush overhanging the channel; and a collapsed stone wall in the middle of the channel.

Based on Corps of Engineers' guidelines, the dam has been classified in the "small" size category and in the "significant" hazard category. The drainage area is 19.58 square miles. The 100-year test flood inflow was calculated to be 3,200 cfs (cubic feet per second). The peak test flood outflow of 2,440 cfs would raise the pond to El 198.0 which would overtop the main part of the dam by 6.6 feet. Most of this flow would be contained within the steep valley of Fort Pond Brook, although some flooding is likely farther downstream along the brook. The spillway can discharge about 1,000 cfs or 40 percent of the test flood outflow before overflowing the left abutment of the dam.

At this time the dam serves no useful purpose and should be removed. However, in the event that the dam is to be retained, it is recommended that the Owner employ a qualified engineering consultant to conduct a more detailed hydraulic and hydrologic study to determine the adequacy of the dam and the potential for flooding along the railroad tracks. The consultant should also conduct a complete geotechnical and structural investigation to determine the present static stability of the dam. The Owner should implement the recommendations of the consultant and also repair the other deficiencies listed above, as described in Section 7.3. The Owner should also

ERIKSON DAM



implement a program of annual technical inspections, a plan for surveillance of the embankment during and after storms, and a warning system for downstream residents. The measures outlined above and in Section 7 should be implemented by the Owner within a period of one year after receipt of this Phase 1 Inspection Report.



A handwritten signature in cursive script, reading "Edward M. Greco".

Edward M. Greco, P.E.  
Project Manager  
Metcalf & Eddy, Inc.

Massachusetts Registration  
No. 29800

Approved by:

A handwritten signature in cursive script, reading "Stephen L. Bishop".

Stephen L. Bishop, P.E.  
Vice President  
Metcalf & Eddy, Inc.

Massachusetts Registration  
No. 19703



ERIKSON DAM

This Phase I Inspection Report on Erikson Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Aramast Mahtesian

ARAMAST MAHTESIAN, MEMBER  
Foundation & Materials Branch  
Engineering Division

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER  
Design Branch  
Engineering Division

Richard J. DiBuono

RICHARD DIBUONO, CHAIRMAN  
Water Control Branch  
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR  
Chief, Engineering Division

## PREFACE

This report is prepared under guidance contained in Recommended Guidelines for Safety Inspection of Dams, for a Phase I Investigation. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general conditions and the downstream damage potential.

ERIKSON DAM

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ERIKSON DAM

**OVERVIEW  
ERIKSON DAM  
ACTON, MASSACHUSETTS**



## SECTION 4

### OPERATING PROCEDURES

- 4.1 Procedures. There are no operating procedures at Erikson Dam.
- 4.2 Maintenance of Dam. The Owner has no program of regular maintenance at the dam. For the most part, the stone foundation of the sawmill has collapsed and there have apparently been no attempts to clear other debris from the channel.
- 4.3 Maintenance of Operating Facilities. There are no operating facilities on the structure. Discharge over the dam is uncontrolled and there are no other operable outlets.
- 4.4 Description of Any Warning System in Effect. There is no warning system in effect at this dam.
- 4.5 Evaluation. The dam is no longer used and could be removed from the site. However, if it is to remain, some maintenance work is required. There is no program of technical inspections or any warning system in effect at Erikson Dam. This is undesirable considering that the dam is in the "significant" hazard category. A program of regular maintenance, and technical inspections, and a surveillance and warning system should be implemented, as recommended in Section 7.3.

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elevation of the brook, erosion on the slope could undercut that part of the foundation adjacent to the brook.

The valley of Fort Pond Brook widens about 600 feet downstream of the dam. Beyond this point, the brook flows in a shallow channel through undeveloped woods and swamps. River Street, a small country road, parallels the channel less than 10 feet above the elevation of the brook.

- 3.2 Evaluation. The visual inspection indicates that the dam is in poor condition and in need of extensive repair work to prevent further deterioration. It is evident that the dam is not maintained. If the structure is to be retained, its condition must be improved. Recommended remedial measures are stated in Section 7.3.

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The rubble remains of the abandoned sawmill building fill the channel downstream of the breached section of the dam (see Photographs No. 6 and 8). Previous inspection reports have suggested that the stones may increase the stability of the dam and should be left in place. There is, however, a wall of rock that is apparently free-standing in the middle of the channel. Besides causing an obstruction to flow over the dam, the wall represents a hazard in that it may collapse of any time.

- c. Appurtenant Structures. There are no appurtenant structures at this site.
- d. Reservoir Area. The impoundment upstream of Erikson Dam is separated into two ponds by the embankment for the Boston & Maine Railroad. The two ponds are hydraulically interconnected as a railroad bridge connects the adjoining railroad embankments. Development along the perimeter of the ponds is limited to four houses situated on Route 27 (Central Street), which parallels the east side of the smaller pond. The remaining area is cultivated fields and undeveloped woodland.
- e. Downstream Channel. Discharge over the dam flows in the narrow channel of Fort Pond Brook (see Photograph No. 2). The steep side slopes of the channel are 20 to 25 feet high in the area of the dam and are heavily eroded. Several trees overhang the channel as a result of erosion of soil from the roots. Bedrock is exposed at the toe of both slopes. Although the upper reach of the channel is partially obstructed by rock and debris, the remainder is generally clear except for a few fallen branches.

There are two houses situated at the top of the left bank of the channel, about 300 feet downstream of the dam. One house is adjacent to the left abutment of the railroad overpass. The other house has a porch which is supported on piers at the edge of the slope. Although both structures are above the calculated flood

ERIKSON DAM

SECTION 3  
VISUAL INSPECTION

3.1 Findings

- a. General. The Phase I Inspection of the Erikson Dam was performed on September 18, 1979. A copy of the inspection checklist is included in Appendix A. Previous inspections were conducted by the Massachusetts Department of Public Works and the Middlesex County Engineering Department. Copies of their reports are included in Appendix B.
- b. Dam. The dam is generally in poor condition. The most apparent deficiencies in the structure are the lack of a low-level outlet and the large amount of leakage between the unmortared blocks of the dam (see Photograph No. 6). At the time of the inspection, water was flowing over the breached section of the dam and under the granite capstones on the unbreached section (see Photograph No. 3). Significant leakage was also observed at the right abutment of the dam where the stone wall ties into the stone foundation of the remaining mill buildings (see Photographs No. 4 and 8). Two 18-inch diameter pipes were visible in the downstream face of the dam. No flow was observed from either, and the lower pipe appears to be crushed at the outlet end. There is no valve or control structure for the pipes and it is likely that both pipes were either blocked or have silted up over the years.

The upstream face of the dam was entirely submerged and therefore not visible for inspection.

There is a bedrock outcrop visible at the downstream toe of each abutment of the dam. Above the left abutment, however, and along the left bank of the discharge channel, erosion has caused deterioration of the upper slope of the channel. There is no riprap or other protection on the earth slope to prevent further erosion. As a result, several trees are overhanging the channel with their root systems exposed. (See Photographs No. 2 and 8.)

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## SECTION 2

### ENGINEERING DATA

- 2.1 General. There are no plans, specifications, or drawings available relative to the design, construction or repair of this dam. Three reports commissioned by the Town of Acton contain some descriptions of the dam and an analysis of the hydraulics of the dam and the Fort Pond Brook channel. The reports, which are on file at the office of the Town Engineer, are listed in Appendix B.

We acknowledge the assistance and cooperation of the Massachusetts Department of Environmental Quality Engineering, Division of Waterways; the Engineering Office for the Town of Acton; and Mr. John Erikson of Erikson Grain Mills, Inc.

- 2.2 Construction Records. There are no construction records or as-built drawings for this dam.

- 2.3 Operating Records. No operating records are available, and there is no daily record kept of the elevation of the pool or rainfall at the dam site.

2.4 Evaluation

- a. Availability. The limited engineering data for this dam consists of the previous inspection reports by Middlesex County and the DPW, and the three hydraulic and hydrologic investigations referred to in Section 2.1 and cited in Appendix B.
- b. Adequacy. The lack of detailed hydraulic, structural and construction data did not allow for a definitive review. Therefore, the evaluation of the adequacy of this dam is based on the visual inspection, past performance and engineering judgment.
- c. Validity. Comparison of the limited available data from the Acton Engineering Department with the field survey conducted during the inspection indicates that the available information is valid for the Phase I Assessment.

ERIKSON DAM

- (6) Zoning: N/A
- (7) Impervious core: Unknown
- (8) Cutoff: Unknown
- (9) Grout curtain: Unknown

h. Spillway

- (1) Type: Broad crest (breach in granite capstone)
- (2) Crest length: 4.3 feet
- (3) Crest elevation: 190.3
- (4) Gates: None
- (5) Upstream channel: None. Upstream face of dam slopes up to crest of spillway and top of dam.
- (6) Downstream channel: None. Flow over spillway drops vertically 13 feet to channel of Fort Pond Brook.

1. Regulating Outlets. There is no regulating outlet at the dam. The Owner reports that a nearby resident had previously added a board across the breach in the top of the dam to raise the water level in the pond. The board has since been removed by the Owner.

ERIKSON DAM

d. Reservoir

- (1) Length of maximum pool: 1,400 feet
- (2) Length of recreation pool: 1,400 feet
- (3) Length of flood control pool: N/A

e. Storage (acre-feet)

- (1) Test flood surcharge (net): 3,564 at El 198.0
- (2) Top of dam: 50
- (3) Flood control pool: N/A
- (4) Recreation pool: 50
- (5) Spillway crest: 50

f. Reservoir Surface (acres)

- \*(1) Top of dam: 8.3
- (2) Test flood pool: 415 (approximate)
- (3) Flood control pool: N/A
- (4) Recreation pool: 8.3
- (5) Spillway crest: 8.3

g. Dam

- (1) Type: dry-stone masonry
- (2) Length: 52.8 feet
- (3) Height: 16.7 feet
- (4) Top width: 4.5 feet
- (5) Side slopes: upstream - approximately 1:1  
downstream - vertical

\*Based on the assumption that the surface area of the pond will not significantly increase with changes in reservoir level from El 190.3 to El 191.4.

ERIKSON DAM

continues in a narrow, rock strewn valley which parallels River Road. Development along the brook is limited to two small factories and a warehouse, until the brook reaches the Merriam Dam, about 4,600 feet downstream.

The dam was designed as an overflow-type structure. Hydraulic analyses indicate that a test flood outflow of 2,440 cfs (100-year storm) will overtop the dam by a maximum of 6.6 feet. All of this flow will be contained by the Fort Pond Brook channel immediately downstream of the dam. The outflow from a one-half PMF results in a reservoir level at El 201.5. Such a flow greatly increases the surface area of the pond and in addition causes flooding along the railroad tracks north of the dam. The spillway can discharge about 1,000 cfs or 40 percent of the test flood outflow before overflowing the left abutment of the dam.

There is no record of a maximum flow over the dam. A highwater mark at Route 27 culvert upstream of the dam was measured at El 193.4.

- c. Elevation (feet above National Geodetic Vertical Datum (NGVD)). A benchmark was established at El 191.4 on the top of the dam. This elevation is shown on a 1961 plan by Fay, Spofford and Thorndike, Inc.

- (1) Top of dam: 191.4 to 194.9
- (2) Test flood pool: 198.0 (100-year flood)
- (3) Design surcharge (original design):  
Unknown
- (4) Full flood control pool: Not Applicable  
(N/A)
- (5) Recreation pool: 190.3
- (6) Spillway crest: 190.3 (breach in top of  
dam)
- (7) Upstream portal invert diversion tunnel:  
N/A
- (8) Streambed at centerline of dam: 178.2
- (9) Tailwater: N/A

ERIKSON DAM

1. Normal Operating Procedure. There is no operating procedure at the dam. A few years ago the Owner removed one of the granite blocks on the top of the dam to create a lower level spillway and thereby reduce the water level in the pond. Flow over this spillway is uncontrolled.

### 1.3 Pertinent Data

- a. Drainage Area. The tributary drainage area above Erikson Dam is approximately 12,530 acres (19.58 square miles). The area consists of about 12 percent lowland and swamps, and 78 percent rolling and hilly woodland. The most highly developed residential areas are within the Town of Acton which comprises approximately the southeastern third of the watershed (see Figure D-1). The remaining area, in Boxborough to the north and west, and in Stow to the south, is sparsely developed.

Long Pond and Fort Pond, which flow directly into Fort Pond Brook, and Grassy Pond, are the major ponds within the drainage area. In addition, Guggins Brook, Heath, Hen, Meadow Brook and several smaller unnamed streams drain the swamps and contribute flow to Fort Pond Brook.

- b. Discharge. Uncontrolled discharge over the dam commences at El 190.3, which is the elevation of the breach created when the section of granite capstone was removed from the crest. Above El 191.4, the entire length of the dam crest serves as a weir. Immediately downstream of the dam, the flow is diverted through a stone culvert in the wall of the saw mill foundation, before it continues downstream in the channel of Fort Pond Brook.

Below the dam, the discharge channel is bounded on the right by the fieldstone and cut granite foundations of the grain mill buildings, and on the left by the remnants of the saw mill foundation. Bedrock outcrops are visible on both banks beneath the foundations. Discharge continues in a fairly steep channel and flows under an arched stone masonry railroad bridge approximately 300 feet downstream. Beyond the bridge, the stream

ERIKSON DAM

elevation) would produce a flood wave 15.3 feet high downstream of the dam. This is only 1.7 feet higher than the stream depth under flood conditions just prior to the failure. The flood would be contained by the steep valley of Fort Pond Brook for the first 2,000 feet. However, flooding in the vicinity of the Cement Dam and the factories is likely where the valley floor widens. Flood damage to the factories and the house on River Street would also probably occur. Beyond the second factory (about 3,000 feet downstream), the flood will dissipate in a broad, low-lying area and be contained by the Merriam Dam and the southern railroad embankment. Accordingly, the dam has been placed in the "significant" hazard category.

- e. Ownership. The dam is owned by Erikson Grain Mill, Inc., Main Street, South Acton, Massachusetts. Mr. John Erikson (telephone: 617/263-4733) granted permission to enter the property and inspect the dam.
- f. Operator. There is no equipment which requires operating, and no known operator of the dam.
- g. Purpose of the Dam. Water stored behind the dam was formerly used for power in the operation of a grist mill and a saw mill at the site. Water was also diverted to a large circular pond in the present mill yard, and used by a textile mill for processing wool cloth. The pond upstream of the dam and the Route 27 embankment is now used solely for limited recreation by nearby residents.
- h. Design and Construction History. There are no drawings or specifications available on the design and construction of this dam. The original dam at this site was built in 1702 for the textile mill. In 1848 the dam was replaced by the present stone masonry structure. Remnants of the stone foundation of the early saw mill are still visible on the north (left) bank of the discharge channel. The building was reportedly dismantled in 1932 but there is no record of subsequent repairs or alterations to the dam itself.

ERIKSON DAM



Water flowing over the right half of the dam drops vertically about 13 feet to Fort Pond Brook. There is no spillway chute or apron to channel the discharge to the brook. Water overflowing the breached section on the left side of the dam is partially obstructed by stone rubble in that part of the channel (see Photographs No. 4 and 8). The rubble is apparently the remnants of the stone foundation of a saw mill. The outline of the foundation (see Figure B-1) suggests that there may have been a waterwheel connected with the mill. An opening at the base of the center stone wall serves as a side channel discharge from the wheel house.

There is no outlet in operation at the dam. Two 18-inch diameter pipes can be seen protruding from the downstream face at the left end of the dam (see Figure B-2 and Photograph No. 6). The invert of the upper pipe is at El 186.9, and the lower pipe is at El 180.2. The function of the pipes is unknown, and both appear to be blocked off. There is no visible gate valve or other mechanism for controlling flow through either pipe.

- c. Size Classification. Erikson Dam is in the "small" size category since it has a maximum height of 16.7 feet and a maximum storage capacity of 50 acre-feet.
- d. Hazard Classification. Fort Pond Brook flows under a railroad bridge about 300 feet downstream of Erikson Dam and continues in a steep, narrow valley (see Photograph No. 2). River Street and the railroad tracks parallel the brook on the north and south walls of the valley. There are two small factory buildings adjacent to the brook, between Erikson Dam and Merriam Dam. These two factories are south of River Street and there is one house north of River Street. There is also a small dam, called the "Cement" Dam about 2,000 feet downstream of Erikson Dam. The 42-inch outlet pipe is left open at this dam and flow over the spillway is uncontrolled.

Failure of Erikson Dam when the pond level is at El 198.0 (the approximate flood pool

ERIKSON DAM

the Town of Acton, Middlesex County, Massachusetts (see Location Map and Drainage Area Map). The coordinates of this location are latitude 42 deg. 27.5 min. north, and longitude 71 deg. 27.3 min. west.

- b. Description of Dam and Appurtenances. Erikson Dam consists of a stone masonry spillway and abutments across the Fort Pond Brook channel (see Figures B-1 and B-2 and Overview Photo). The dam is 52.8 feet long and a maximum of 16.7 feet high from the top of the left abutment to the streambed (see Photographs No. 1 through 6). The top of the dam is approximately 4.5 feet wide and formed of cut granite blocks. The top is at El 191.4 for most of its length. The left abutment, which is also stone, steps up to El 194.9 and ties into the steep bank of the channel. The right side of the dam abuts the fieldstone foundation of a former mill building. Bedrock outcrops are visible on both sides of the channel, just downstream of the left abutment and underlying the foundation on the right abutment (see Photographs No. 4 and 8). There is no information on a core wall or cutoff beneath the dam. The upstream face of the dam which is submerged in the pond was determined to be at a 1:1 slope. The downstream face of the dam is nearly vertical, with approximately a 1-foot batter. There is no mortar in the joints between the stone blocks of the dam.

The dam was originally constructed as an overflow structure. However, the Owner has removed one block from the top of the dam to create a "low-level" spillway at El 190.3 (see Photograph No. 3). This spillway is 4.3 feet wide and approximately 1 foot deep.

There is no approach channel to the dam. As shown on Figure B-1, flow to the structure is partially controlled by the Route 27 highway embankment which is located about 30 feet upstream of the dam at the outlet (see Photograph No. 1). The culvert under the embankment is constructed of mortared stone blocks and is 22 feet wide and 103 feet long. The crown of the arched culvert is at El 198.9 at the downstream end.

ERIKSON DAM

NATIONAL DAM INSPECTION  
PROGRAM

PHASE I INSPECTION REPORT

ERIKSON DAM

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Metcalf & Eddy, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Contract No. DACW 33-79-C-0054, dated March 27, 1979, has been assigned by the Corps of Engineers for this work.

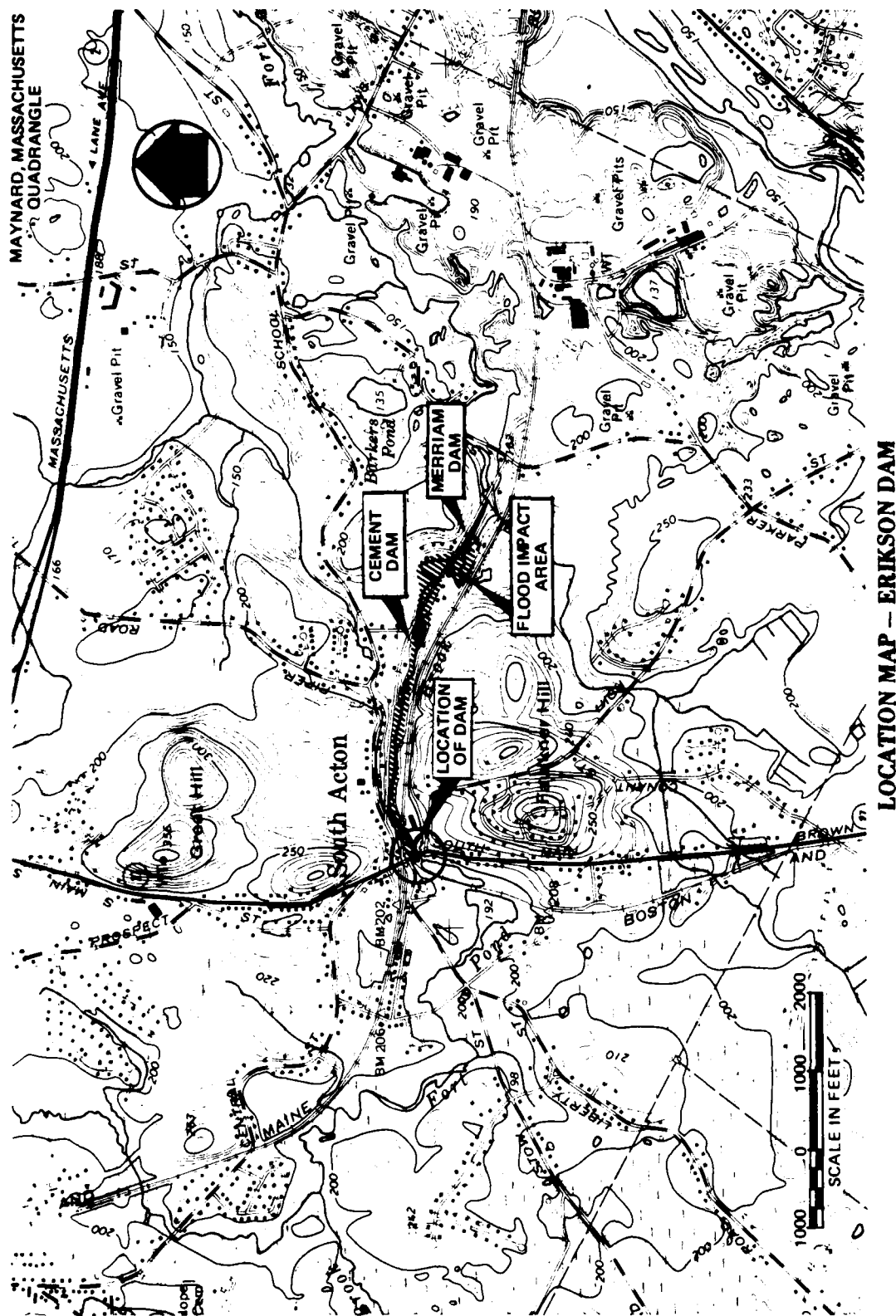
b. Purpose:

- (1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
- (2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.
- (3) Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. The dam is located on Fort Pond Brook, a tributary of the Assabet River, in

ERIKSON DAM



SECTION 5  
HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

- a. General. Erikson Dam is a stone-masonry overflow structure on Fort Pond Brook. Maximum storage in the ponds upstream of the dam is estimated to be 50 acre-feet. The dam is 52.8 feet long. Normal discharge is over the top of the dam which is at El 191.4 for most of its length. The maximum elevation on the dam is El 194.9 at the left abutment. A low-level spillway has been created by removal of one capstone from the top of the dam. The breach is 4.3 feet long and at El 190.3. There is no low-level outlet at the dam.

The drainage area is 19.58 square miles of swamp and hilly woodland. Long Pond and Fort Pond are the two major ponds within the watershed. Residential development is light to moderate within the Town of Acton. The remainder of the watershed is sparsely developed.

Fort Pond Brook flows through two culverts immediately upstream of Erikson Dam. The first is under a railroad embankment, which separates the former mill pond into two smaller ponds. The second is a 103-foot long stone masonry culvert under Route 27 (see Photograph No. 1). The outlet to the culvert ends in a stone masonry headwall located about 30 feet upstream of the dam.

A second set of railroad tracks parallels the left side of the mill pond and passes under Route 27 just north of the Route 27 culvert. The tracks are at El 199+ and during periods of high flow, it is possible that some flooding could occur along these tracks, before the flow rejoins Fort Pond Brook downstream of the dam.

Fort Pond Brook flows through a second railroad culvert about 200 feet downstream of

ERIKSON DAM

Erikson Dam. In addition, the "Cement Dam" and "Merriam" Dam are located on the brook, 2,000 and 4,600 feet, respectively, downstream of Erikson Dam.

- b. Design Data. There are no hydraulic or hydrologic computations available for the design of the dam. A previous inspection report, which is included in Appendix B, completed preliminary hydraulic analyses which indicated that the spillway capacity would be exceeded during a rare flood. According to the report about 82 percent of the maximum flood flow would overtop the dam and about 18 percent would flow along the railroad tracks north of the dam.
- c. Experience Data. The dam is designed as an overflow structure and as such is frequently overtopped. The Owner keeps no record of discharge over the dam or rainfall at the site. A highwater mark on the upstream culvert was surveyed at El 193.4.
- d. Visual Observations. Discharge over the dam commences at El 190.3 in the breach and at El 191.4 for the remaining length. The dam functions as a broad-crested weir. There is no approach channel to the weir, although the Route 27 culvert does provide some control to flow. Flow over the top of the dam drops vertically to the natural channel of Fort Pond Brook, a distance of about 13 feet. The channel slopes at about 1 percent between Erikson Dam and the Cement Dam, about 2,000 feet downstream. The steep side walls of the channel are 20 to 24 feet high for approximately the first 600 feet of its length. Except for stone rubble and debris at the toe of the dam, the Fort Pond Brook channel is relatively clear.

There is no low-level outlet at the dam or any apparent outlet control works.

A more detailed discussion of the condition of the dam is given in Section 3, Visual Inspection.

ERIKSON DAM

- e. Test Flood Analysis. Erikson Dam has been placed in the "small" size category and the "significant" hazard category. In accordance with Corps of Engineers' guidelines, a test flood equal to the 100-year storm (approximately one-quarter the Probable Maximum Flood (PMF)) was used to evaluate the capacity of the dam/spillway.

The PMF rate for the Erikson Dam watershed was determined to be 650 cfs per square mile of drainage area. This calculation is based on the average slope of the watershed of 0.65 percent, the pond-plus-swamp area to drainage area ratio of 12 percent and the Corps of Engineers' guide curves for Maximum Probable Flood Peak Rates (dated December 1977). The guide curve for "flat and coastal" topography was used to determine the peak flow rate. Applying one-quarter the PMF rate to the 19.58 square miles of drainage area results in a calculated peak flood flow of 3,200 cfs as the test flood inflow. By adjusting the test flood inflow for surcharge storage, the maximum discharge rate was established as 2,440 cfs (125 cfs per square mile) with the pond level at El 198.0. The spillway can discharge about 1,000 cfs or 40 percent of the test flood outflow before overflowing the left abutment of the dam.

During the test flood, flow over the top of the dam would reach a maximum head of 6.6 feet. Under these conditions, the discharge would be contained within the steep valley of Fort Pond Brook. Upstream, however, the higher pond level would cause considerable flooding in adjacent swamps and low-lying area. As a result, the surface area of the pond would increase from 8.3 acres to 415.0 acres.

The dam and upstream culvert under Route 27 are adequate to discharge the 100-year flood (or one-quarter PMF) with the pond level at El 198.0. Above approximately El 199, however, the discharge from the pond will also flow through the railroad culvert north of the Route 27 culvert. The flood would follow the railroad tracks and eventually return to the Fort Pond Brook Valley downstream of Erikson Dam. As shown on the figure in Appendix D,

ERIKSON DAM

page D-7, 25 percent of the outflow from a one-half PMF storm would be discharged through the railroad culvert. There are a few commercial establishments and residences that could be affected by the flooding.

- f. Dam Failure Analysis. The peak discharge rate due to failure was calculated assuming a 21.1 foot wide breach in the dam and a head of 19.8 feet. Since the entire dam serves as a spillway, the pond level behind the dam was arbitrarily set at the 100-year storm elevation for the failure analysis. The resulting discharge rate is 3,126 cfs. However, the upstream Route 27 culvert prevents any sustained flow through the breach at this rate. As a result of the controlling effect of this culvert, the sustained flow must be adjusted to 2,630 cfs or 190 cfs more than the test flood discharge. This flow would produce a flood wave about 15 feet high just below the dam, as compared to a depth of water in the stream of about 13.6 feet prior to failure.

The high stone arched railroad culvert located downstream of the dam would have little effect in reducing the discharge rate due to failure of the dam.

It is likely that the volume of water released during a 100-year storm, combined with the small increment resulting from failure of the dam would cause some damage to two small factories located approximately 2,000 and 2,900 feet downstream of the dam on River Road. The Cement Dam located just upstream of the first factory would probably be overtopped. However, it is likely that the flood wave will be contained by Merriam Dam and the railroad embankment, about 4,600 feet downstream. For these reasons the dam has been placed in the "significant" hazard category.

ERIKSON DAM



## SECTION 6

### STRUCTURAL STABILITY

#### 6.1 Evaluation of Structural Stability

- a. Visual Observations. The evaluation of the structural stability of Erikson Dam is based on previous inspection reports, and on the visual inspection conducted on September 18, 1979.

The dam was found to be in poor condition and requiring considerable repair work to prevent further deterioration. There is leakage through the unmortared joints of the stone masonry structure. In addition, the free-standing stone wall in the discharge channel is a potentially dangerous situation, particularly since the dam is easily accessible by trespassers.

A 1960 report to the Middlesex County Commissioners stated "The stability of the structure is considered adequate." According to the report, the apparent stability was in part attributable to the accumulation of rock debris downstream of the left abutment of the dam. At the present time, however, it is recommended that a more detailed investigation by a structural engineer should be conducted on the stability of the structure.

- b. Design and Construction Data. The dam was constructed in 1848. There are no plans or specifications available showing the design and original construction of the dam, nor is there any information on a core or cutoff wall within the stone masonry structure. More recent studies of the dam and Fort Pond Brook have provided limited hydraulic and hydrologic data.
- c. Operating Records. There is no instrumentation of any type at Erikson Dam, and no instrumentation was ever installed at this site. The performance of the dam under prior loading can only be inferred by physical evidence at the site.

ERIKSON DAM

- d. Post-Construction Changes. No information is available relative to post-construction changes to the dam. A historical publication (listed in Appendix B) states that the saw mill that originally occupied the left bank of the discharge channel was removed in 1932, and only the foundation remains. There is no information on the outlet pipes visible on the downstream face of the dam or on any operating mechanisms which may have existed at the site.
- e. Seismic Stability. Erikson Dam is located in Seismic Zone No. 2, and in accordance with Phase I "Recommended Guidelines" does not warrant seismic analyses at this time.

ERIKSON DAM

## SECTION 7

### ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

#### 7.1 Dam Assessment

- a. Condition. Based upon a review of available data and the visual inspection of the site, Erikson Dam has been found to be in poor condition and in need of repair to prevent further deterioration. Several signs of distress were observed at the site: lack of a low-level outlet; uncontrolled and extensive leakage through the unmortared joints of the masonry dam; loose stone blocks on the top of the dam and downstream of the dam in the vicinity of the former saw mill; heavy accumulation of debris in the discharge channel; and erosion of the slopes of the discharge channel, particularly on the left bank.

Hydraulic analyses indicate that the peak flood outflow of 2,440 cfs (100-year storm) with the pond level at El 198.0 will overtop the dam by 6.6 feet, but will not overtop the banks of the stream channel. The spillway can discharge about 1,000 cfs or 40 percent of the test flood outflow before overflowing the left abutment of the dam.

- b. Adequacy. The lack of detailed design and construction data did not allow for a definitive review. Therefore, the evaluation of this dam is based on a review of the available data, the visual inspection, past performance and engineering judgment.
- c. Urgency. The recommendations and remedial measures outlined below should be implemented by the Owner within one year after receipt of this Phase I Inspection Report.
- d. Need for Additional Investigation. Additional investigations to further assess the adequacy of the dam are outlined below in Section 7.2, Recommendations.

ERIKSON DAM

7.2 Recommendations. The dam no longer serves any useful purpose, and in view of its poor condition, probably should be removed. If, however, the Owner chooses to retain the structure, it is recommended that a qualified engineering consultant be engaged to:

- a. Conduct a complete geotechnical and structural investigation of the dam. The investigation would determine the present static stability of the dam and should include development of recommended repair procedures.
- b. Conduct a more detailed hydraulic and hydrologic investigation to evaluate the adequacy of the spillway and the potential for overtopping the railroad tracks north of the Route 27 culvert. Such an investigation should include an evaluation of the capacity of the Route 27 culvert and design of a low-level outlet from the pond.

The Owner should implement the recommendations of the engineering consultant.

### 7.3 Remedial Measures

- a. Operating and Maintenance Procedures. If the dam is to be retained, it is recommended that the Owner accomplish the following:
  - (1) repair the dam in accordance with the recommendations of the engineering consultant;
  - (2) construct a low-level outlet;
  - (3) place riprap or other form of slope protection along the left bank of the discharge channel to prevent further erosion of the bank, particularly above the left abutment;
  - (4) remove the accumulated wood and debris from the discharge channel;
  - (5) remove any trees overhanging the discharge channel;
  - (6) remove the stone wall still standing in the middle of the channel;

ERIKSON DAM

- (7) implement a systematic program of maintenance inspections. As a minimum, the inspection program should consist of a monthly inspection of the dam and appurtenances, supplemented by additional inspections during and after severe storms. All repairs and maintenance should be undertaken in accordance with all applicable State regulations,
- (8) periodic technical inspections of this dam should be continued on an annual basis;
- (9) institute a definite plan for surveillance of the dam during and after periods of unusually heavy rainfall and establish a plan to notify downstream residents in case of an emergency at the project.

7.4 Alternatives. The alternative to implementing the recommendations and remedial measures listed above would be to drain the pond and remove the dam. If this alternative is chosen, consideration should be given to protecting the foundation of the upstream culvert, to prevent undercutting by the stream.

ERIKSON DAM

APPENDIX A  
PERIODIC INSPECTION  
CHECKLIST

ERIKSON DAM

# PERIODIC INSPECTION

## PARTY ORGANIZATION

PROJECT ERIKSON DAM

DATE September 18 , 1979

TIME 8:00 A.M.

WEATHER Sunny, 60's

W.S. ELEV. 190.8 U.S. 179.8 DN.S.

### ARTY:

1. <u>S. Pierce</u>	6. <u>L. Branagan</u>
2. <u>E. Greco</u>	7. _____
3. <u>F. Sviokla</u>	8. _____
4. <u>W. Checchi</u>	9. _____
5. <u>P. Reilly</u>	10. _____

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Dam</u>	<u>E. Greco/S.Pierce</u>	
2. <u>Spillway</u>	<u>E. Greco/S.Pierce/L.Branagan</u>	
3. _____		
4. _____		
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

# PERIODIC INSPECTION CHECK LIST

JECT ERIKSON DAM DATE September 18, 1979  
 JECT FEATURE Dam NAME E. Greco  
 CIPLINE Geotechnical NAME S. Pierce

te: u/s = upstream; d/s = downstream

AREA EVALUATED	CONDITIONS
<u>EMBANKMENT</u>	Dam/spillway is vertical weir constructed of cut granite blocks
rest Elevation	
urrent Pool Elevation	190.8
aximum Impoundment to Date	Unknown. High water mark on upstream culvert at El. 193.4
urface Cracks	Stone intact; no grout between blocks
avement Condition	No pavement
ovement or Settlement of Crest	Top of dam irregular due to placement of blocks. No apparent movement.
ateral Movement	None apparent
ertical Alignment	Relatively flat
orizontal Alignment	Dam slightly tilted upstream
ondition at Abutment and at Concrete Structures	Rt. Abutment: fieldstone foundation of mill bldg.; rock outcrop at base Lt. Abut.: stone wall ties into earth bank and rock outcrop
ndications of Movement of Structural Items on Slopes	N/A
respassing on Slopes	N/A
oughing or Erosion of Slopes or Abutments	Lt. abutment: loose stones from saw mill foundation Rt. abutment: okay
ock Slope Protection - Riprap Failures	None
nusual Movement or Cracking at or near Toes	Toe of wall submerged
nusual Embankment or Downstream Seepage	Leaks through joints of stone construction- particularly below capstones, and at right end of dam.
iping or Boils	None visible
oundation Drainage Features	None visible
oe Drains	None visible
nstrumentation System	None



# PERIODIC INSPECTION CHECK LIST

OBJECT ERIKSON DAM DATE September 18, 1979  
 OBJECT FEATURE Rte 27 Culvert & Embankment NAME E. Greco  
 DISCIPLINE Geotechnical NAME S. Pierce

AREA EVALUATED	CONDITIONS
<u>M EMBANKMENT</u>	Arched stone masonry culvert under Rte 27 embankment conducts discharge from pond to dam
Crest Elevation	Crown of arch at Elevation 198.9
Current Pool Elevation	190.8
Maximum Impoundment to Date	High water mark on culvert at El. 194.3
Surface Cracks	None
Pavement Condition	Excellent-asphalt pavement of roadway
Movement or Settlement of Crest	None
Lateral Movement	None
Vertical Alignment	Road slopes to south and east
Horizontal Alignment	Straight
Condition at Abutment and at Concrete Structures	bridge at left abutment-recently repaired; right abutment is natural ground
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	Minor foot traffic
Sloughing or Erosion of Slopes or Abutments	u/s: minor erosion around wingwalls of culvert due to foot traffic. d/s: minor erosion due to surface runoff; loose gravel.
Rock Slope Protection - Riprap Failures	u/s: no riprap, many trees, up to 12" diam. d/s: slope covered with brush; abandoned roadway still visible at toe of slope.
Unusual Movement or Cracking at or near Toes	None visible
Unusual Embankment or Downstream Seepage	None visible
Piping or Boils	-
Foundation Drainage Features	-
Toe Drains	-
Instrumentation System	-

# PERIODIC INSPECTION CHECK LIST

SUBJECT ERIKSON DAM DATE September 18, 1979  
 SUBJECT FEATURE Spillway NAME E. Greco  
 DISCIPLINE Geotechnical NAME S. Pierce

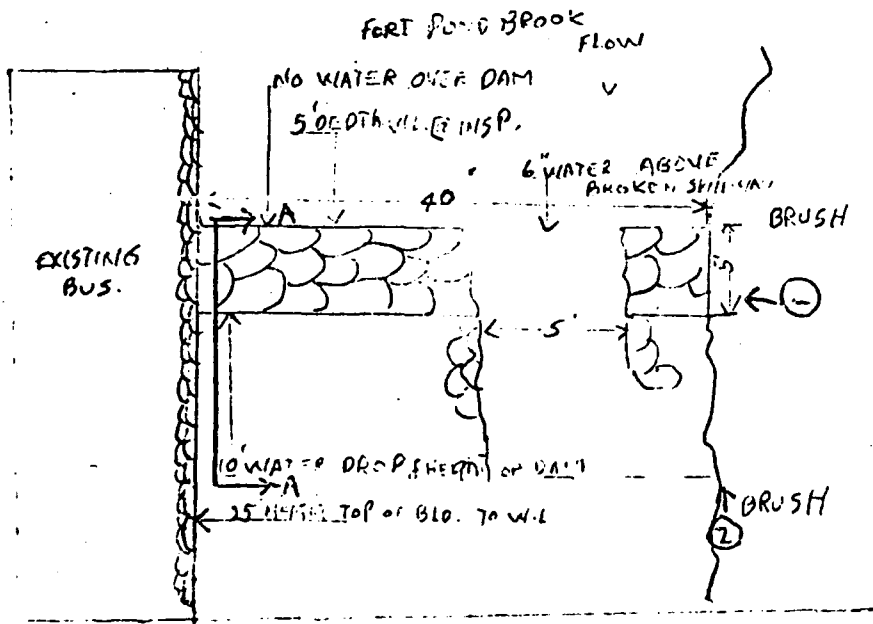
AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	Spillway is top of dam. Owner has removed one granite block from cap wall to allow overflow; approximately 1 foot deep.
Approach Channel	
General Condition	No approach channel. u/s face of dam is sloped. Rte 27 culvert conducts flow to dam.
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	-
Weir and Training Walls	N/A: training walls are adjacent capstones
General Condition of Concrete	
Rust or Staining	
Spalling	
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	
Discharge Channel	Discharge flows over "weir" through rubble from sawmill, then through stone culvert to d/s channel
General Condition	Very poor-channel filled with stone rubble from sawmill ruins, also other debris.
Loose Rock Overhanging Channel	Stone blocks up to 3' long form wall in channel-possibly right wall of sawmill or tailrace-appears to be very unstable.
Trees Overhanging Channel	6 small diameter trees on left side of channel. Roots and ledge exposed due to slope erosion.
Floor of Channel	Filled with construction rubble for about 40-50 feet d/s
Other Obstructions	Tree stumps, telephone poles, etc.
General	Two outlet pipes visible on d/s face of dam. Both broken, deteriorated. Lower pipe appears to have been crushed. No flow from either pipe. No apparent operating mechanism.

DAM NO. 4-9-2-1

1. Risk to life and property in event of complete failure.

No. of people NONE  
No. of homes "  
No. of businesses "  
No. of industries "  
No. of utilities "  
Type \_\_\_\_\_  
Type \_\_\_\_\_  
Railroads B&M R.R. PARALLEL TO BROOK, DOWNSTREAM  
Other dams 2 DAMS DOWNSTREAM, CEMENT DAM, 4-4-2-4, BELLEWS FARM MILL DAM, 4-4-2-3  
Other \_\_\_\_\_

2. Attach sketch of dam to this form showing section and plan  $8\frac{1}{2} \times 11$ " Sheet.



TOP VIEW

SKETCH NOT TO SCALE

DESCRIPTION OF DAM  
DISTRICT #4

Submitted by FRANCIS H. PARE & ADAM Z. PIZAN  
8-6-73

Dam No. 4-9-2-1  
City/Town SOUTH ACION, DIZ  
Name of Dam ERIKSON DAM

Location: Topo Sheet No. 26A  
Provide 8 1/2" x 11" in clear copy of topo map with location of Dam clearly indicated.

Year built: 1893 Year/s of subsequent repairs NONE VISIBLE

Purpose of Dam: Water Supply \_\_\_\_\_  
Irrigation \_\_\_\_\_  
Recreational L  
Other \_\_\_\_\_

Drainage Area: 8.8 SQ. MI. 5,632 ACRES.

Normal Ponding Area: 160 acres; Ave Depth 6'  
Impoundment: 320 MIL gals; 960 acre ft.

No. and type of dwellings located adjacent to pond or reservoir  
i.e. summer homes etc. ADM. B. & F. GARDEN, HOUSES 12 ADJACENT TO DAM

Dimensions of Dam: Length 40' Max. Height 10'  
Slopes: Upstream Face VERT.  
Downstream Face \_\_\_\_\_  
Width across top 5'

Classifications of Dam by Materials:  
Earth \_\_\_\_\_ Conc. Masonary \_\_\_\_\_ Stone Masonary L  
Timber \_\_\_\_\_ Rockfill \_\_\_\_\_ Other \_\_\_\_\_

- A. Description of present land usage downstream of dam: 20% rural;  
30% urban
- B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure  
No \_\_\_\_\_ Yes L

4-9-2-1

-3-

2) Remarks & Recommendations: (Fully Explain)

DAM NEEDS <sup>MAJOR</sup> ~~MINOR~~ REPAIRS, REPLACING LOOSENEED ROCKS,  
AND MISSING MASONRY IN SPILLWAY.  
SEE photographs.

3) Overall Condition:

1. Safe ☒ ? How
  2. Minor repairs needed ~~needed~~
  3. Conditionally safe - major repairs needed ☒
  4. Unsafe
  5. Reservoir impounded no longer exists (explain)
- Recommendation from inspection list

2. DAM NO. 4-9-2-1  
Downstream Face of Dam: Condition: 1. Good ☒ 2. Minor Repairs ☐  
3. Major Repairs ☒ 4. Urgent Repairs ☐

Comments: MAJOR REPAIRS REPLACING ROCKS AND REPAIRING  
STONE MASONRY.

Emergency Spillway: Condition: 1. Good ☐ 2. Minor Repairs ☐  
3. Major Repairs ☒ 4. Urgent Repairs ☐

Comments: WATER FLOWS THROUGH BREACHED OPENING

Water level @ time of inspection: ft. above 0.5' below  
top of dam ☐ Principal spillway ☒  
other ☐

Summary of Deficiencies Noted:

Growth (Trees and Brush) on Embankment ☒

Animal Burrows and Washouts ☐

Damage to slopes or top of dam ☐

Cracked or Damaged Masonry ☒

Evidence of Seepage ☐

Evidence of Piping ☐

Erosion ☐

Leaks ☐

Unusual and/or unusual sounding noise ☐

Obstructed or blocked spillway ☐

# INSPECTION REPORT - DAMS AND RESERVOIRS

(1.) Location: ~~City/Town~~ ACTON

Dam No. 4-9-2-1

Name of Dam ERICKSON'S DAM

Inspected by A. Z. PIZANO

F. H. PAGE  
Date of Inspection 8-6-7

(2) Owners: per: Assessors ☒ Prev. Inspection \_\_\_\_\_

Reg. of Deeds \_\_\_\_\_ Pers. Contact \_\_\_\_\_

1. JAMES H. ERICKSON 153 SUMMER ST. W. ACTON, MASS. - 01720 263-2546  
Name St. & No. City/Town State Tel. No.

2. \_\_\_\_\_  
Name St. & No. City/Town State Tel. No.

3. \_\_\_\_\_  
Name St. & No. City/Town State Tel. No.

(3) Caretaker: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

SAME  
Name St. & No. City/Town State Tel. No.

(4) No. of Pictures taken 2

(5) Degree of Hazard: (if dam should fail completely)\*

1. Minor ☒ 2. Moderate \_\_\_\_\_  
3. Severe \_\_\_\_\_ 4. Disastrous \_\_\_\_\_

\*This rating may change as land use changes (future development)

(6) Outlet Control: Automatic \_\_\_\_\_ Manual \_\_\_\_\_

NONE  
Operative yes: \_\_\_\_\_ no: \_\_\_\_\_

Comments: WATER FLOWS THROUGH DAMAGED SPILLWAY

(7) Upstream Side of Dam: Condition:

1. Good \_\_\_\_\_ 2. Minor Repairs \_\_\_\_\_  
3. Major Repairs ☒ 4. Urgent Repairs \_\_\_\_\_

Recommendation: REPLACEMENT OF ROCKS AND REPAIRING OF STONE MASONRY RECOMMENDED

Inspection Dam #4-9-2-1  
Erickson's Dam  
Acton

-2-

It may be that the dam no longer serves a useful purpose, in which breaching should be considered in lieu of extensive repairs. In the event that you intend to breach the dam then the reservoir must be drawn down in such a way so that there is no risk to lives or damage to property downstream. After the reservoir has been drawn down then a wide, deep breach should be established to accomodate anticipated flows.

We call these consitions to your attention and expect you to take appropriate action. If we may be of assistance please do not hesitate to contact us. Your questions may be directed to Mr. Leo Andronico or Mr. John Piaseczny of this office, telephone 727-4793.

Very truly yours,

*WEN*  
*2/24*  
LRA:mey  
cc C.F.Mistretta  
L.LaBelle

MALCOLM E. GRAF  
Associate Commissioner



February 5, 1974

Mr. James H. Erickson  
153 Summer Street  
West Acton, Massachusetts

Re: Inspection-Dam #4-9-2-1  
Acton  
Erickson's Dam

Dear Mr. Erickson:

On August 6, 1973, an engineer from the Massachusetts Department of Public Works inspected the above dam, of which you are the owner.

The inspection was made in accordance with Chapter 253 of the Massachusetts General Laws, as amended by Chapter 595 of the Acts of 1970.

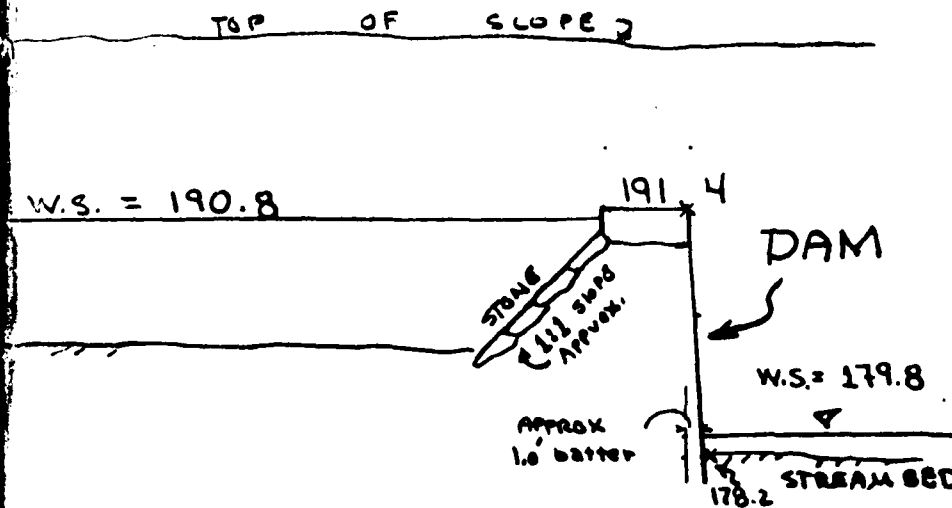
The results of the inspection indicate that repairs are needed. The following conditions were noted that require attention:

1. It appears that this dam has been neglected for a long period of time. The stone masonry wall requires extensive rebuilding. Many stones are either missing or displaced.
2. The spillway is in poor condition and should be repaired or reconstructed.
3. Trees and brush growing near and in the wall should be removed and the resultant voids filled with mortar.
4. Remove all of the debris from the area.

OF  
SLOPE

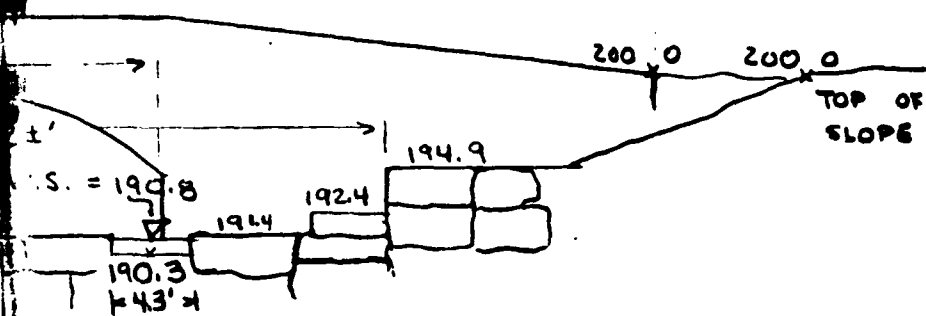
# NOTES:

1. ELEVATIONS SHOWN BASED ON CREST  
ELEV = 191.4 (MSL) AS SHOWN ON  
1962 PLAN BY FAY, SPOFFORD &  
THORNDIKE, INC. BOSTON, MASS. .
2. INFORMATION SHOWN BASED ON  
FIELD SURVEY OF 18 SEPT. 1979 .



REDACTED & COPY, PER.	U.S. ARMY ENGINEER DIVISION
REDACTED	CHIEF OF ENGINEERS
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	
ERIKSON DAM	
FIGURES D-8 PROFILES THROUGH DAM AND	
DOVE 27 CULVERT	
FRONTIER ARCADE DIVISION	MASSACHUSETTS
SCALE: 1" = 10'	DATE: SEPTEMBER, 1979 -

393

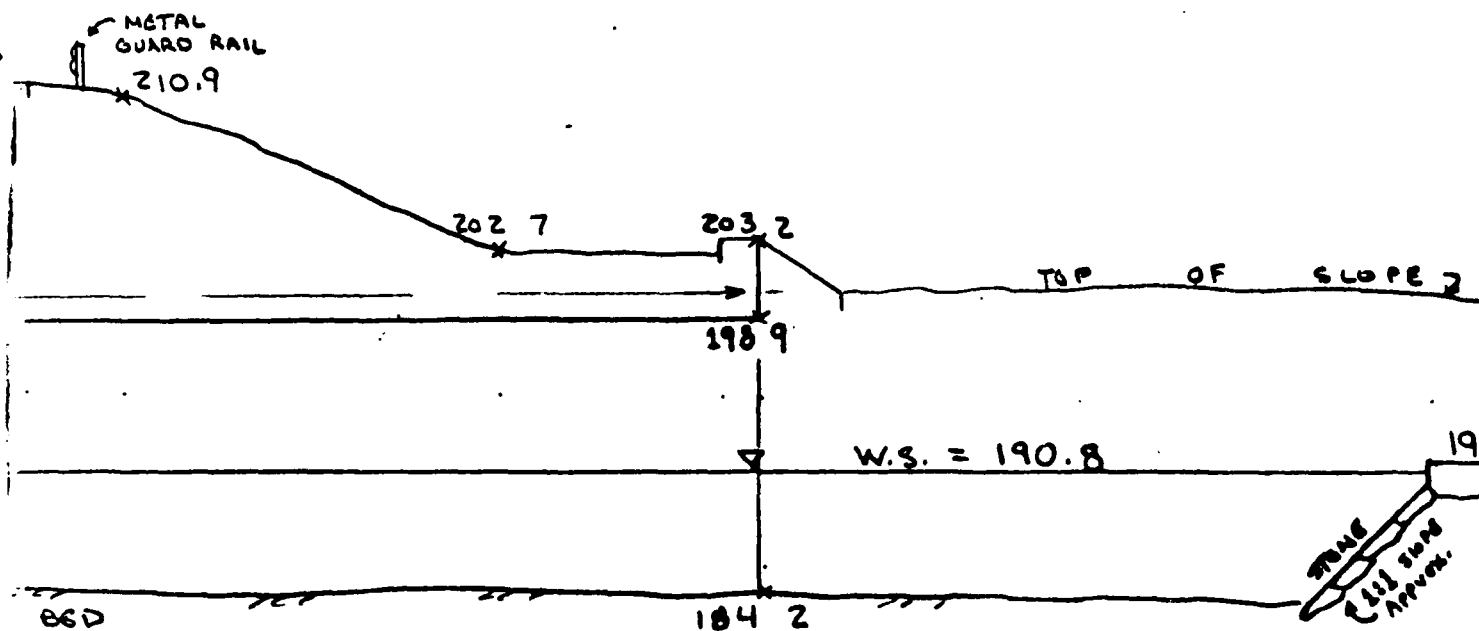


NOTES:

1. ELEVATIONS SHOWN BASED  
ELEV = 191.4 (MSL) AT  
1962 PLAN BY FAY  
THORNDIKE, INC. BOSTON
2. INFORMATION SHOWN BY  
FIELD SURVEY OF 18

1-1

CREST



2-2

FEET



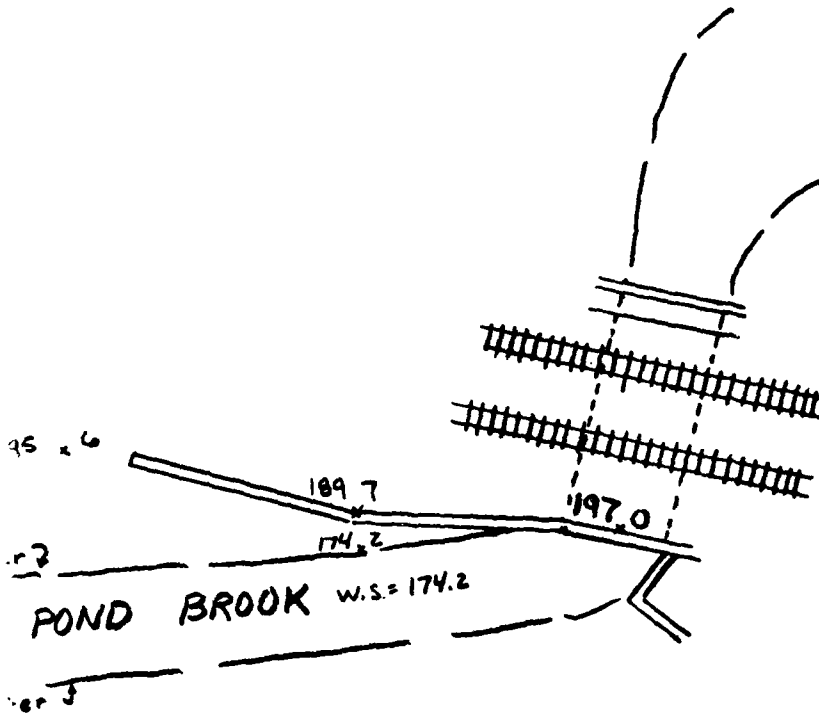
VERTICAL

APPROX  
1.0' BATTER

STATE OF NEW YORK
NATIONAL BUREAU OF SURVEY
ERIKSON
FIGURE 2-2 PROFILE THE ROUTE OF CANAL
TRANSVERSE SECTION 2-2
SCALE: 1" = 10'

293

10/3



SCALE in FEET

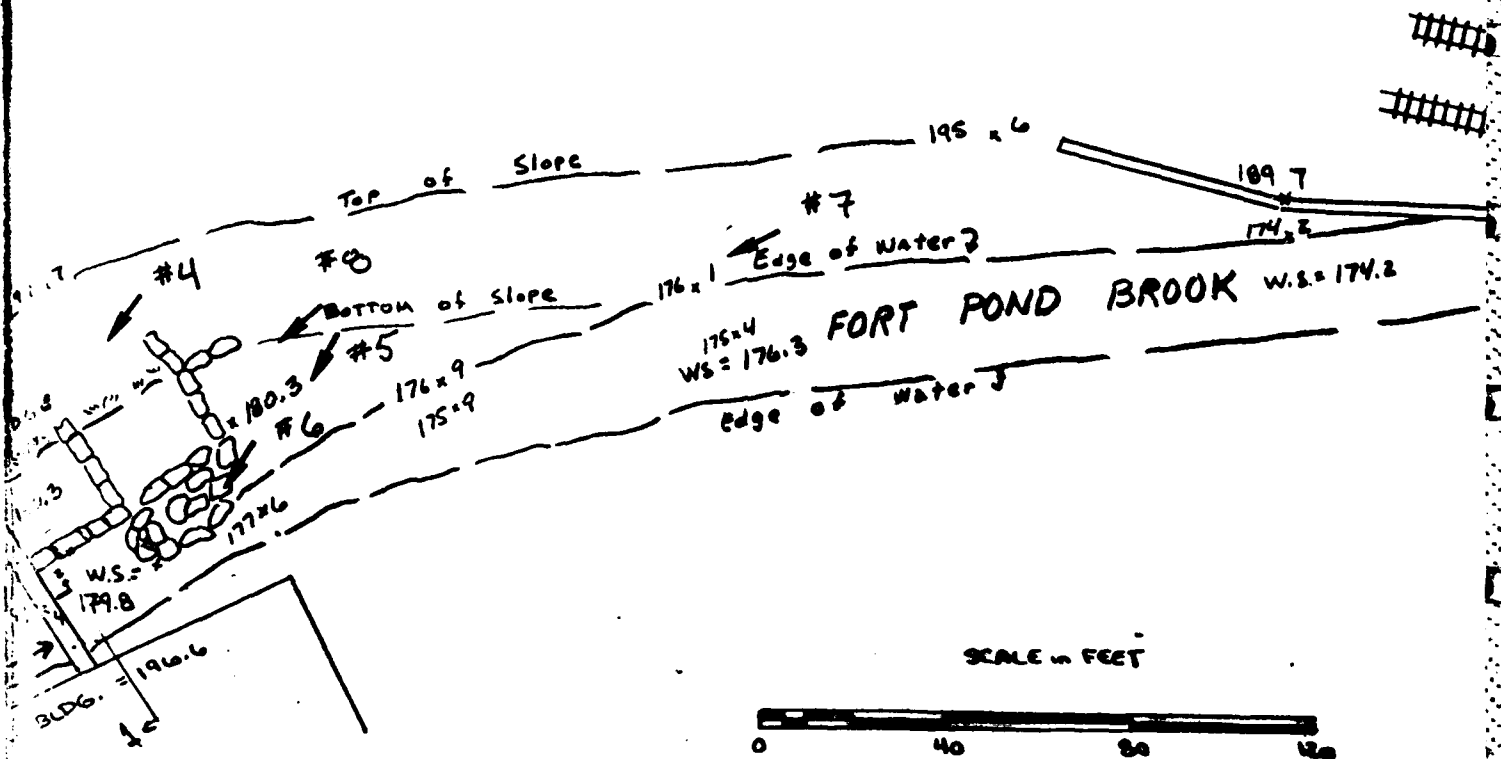


WHEEL & RAY, INC.	U.S. ARMY ENGINEER DIV. NEW ENGLAND
MADE IN U.S.A.	MADE IN U.S.A.
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	
ERIKSON DAM	
FIGURE D-1 PLAN OF DAM	
TRIBUTARY ASSAQUET RIVER	MASSACHUSETTS
SCALE: 1" = 50'	DATE: SEPTEMBER, 1970

393



B + M. RAILROAD  $198 \times (\pm)$

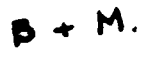


NOTES:

1. ELEVATIONS SHOWN BASED ON CREST ELEV = 191.4 (NGVD) AS SHOWN ON 1962 PLAN BY FAY, SPOFFORD & THORNDIKE, INC., BOSTON, MASS.
2. INFORMATION SHOWN BASED ON FIELD SURVEY OF 18 SEPT. 1979.
3. #2 INDICATES LOCATION AND DIRECTION OF VIEW FOR PHOTOGRAPHS.

293

THORNDIKE & SPOFFORD, INC.
NATIONAL PROGRAM OF
ERIKS
FIGURE D-1
THORNDIKE & SPOFFORD RIVER
SCALE: 1" = 40'



193

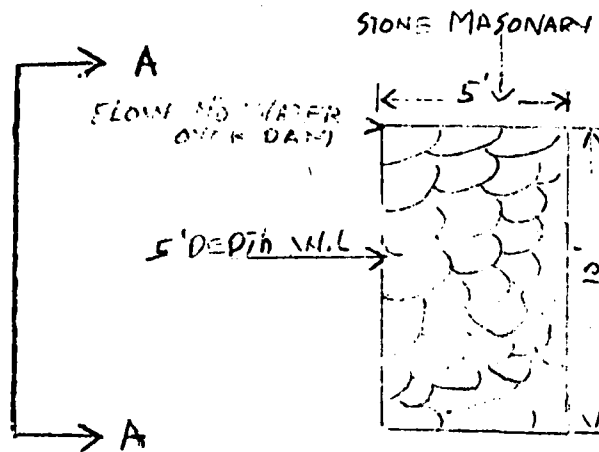
APPENDIX B

PLAN OF DAMS AND PREVIOUS  
INSPECTION REPORTS

	<u>Page</u>
Figure B-1, Plan of Dam	B-1
Figure B-2, Profiles through Dam and Route 27 Culvert	B-2
Previous Inspection Reports	
Massachusetts Department of Public Works, 1973	B-3
Middlesex County Engineering Department, 1960	B-11
Report Upon Erikson Dam, South Acton, Massachusetts, 1960	B-13

ERIKSON DAM





X SECTION AA

SKETCH NOT TO SCALE

TOWN South Acton, Mass. DAM NO. Q-10  
LOCATION Mass. Route 27 STREAM Fort Pond Brook

MIDDLESEX COUNTY ENGINEERING DEPARTMENT  
CAMBRIDGE, MASSACHUSETTS

D A M I N S P E C T I O N R E P O R T

Owned by Henry Erikson Place South Acton, Mass. Use None

Inspected by Joseph S. Krzywicki Date 24 February 1960

Type of Dam Stone masonry overflow Condition Fair

SPILLWAY Length 48 ft. Ht. to Top Emb. Section 3.25 ft.

Flashboards in Place None Ht. of -- Recent Repairs Unknown

Condition Fair

Repairs Needed None observed

RETAINMENT Length 3 ft. Height ± 15 ft. Type Earth

Recent Repairs Unknown

Condition Fair

Repairs Needed None

GATES Number None observed Size  Types

Recent Repairs

Condition

Repairs Needed

LEAKS Detailed Description and Location on Back of Sheet None observed

How Serious due to water over spillway.

DATE: 24 February 1960

*Joseph S. Krzywicki*  
Signature Inspecting Engineer

P-c. Action - See Back of Sheet Engineer - Matcalt & Eddy, Boston, Mass.  
Title

Special Remarks and Characteristics on Back of Sheet

LEAKS: None observed due to quantity of water flowing  
over spillway ( $\pm 5$  ft.)

RECOMMENDED ACTION: Make another inspection of dam in "dry  
weather" when there should be little or no flow  
over spillway

See attached report

SPECIAL REMARKS: Mill ruins immediately downstream of spillway section  
(North portion) are contributing to stability of Northerly  
section of spillway - Culverts upstream of dam are providing  
some control on flows reaching spillway.

J-MCC Dam  
GET:ap  
3/29/60

Q-10

REPORT  
upon  
ERIKSON DAM  
SOUTH ACTON, MASSACHUSETTS

General

The "Erikson Dam" across Fort Pond Brook is located in South Acton, Mass., about 90 feet downstream from the centerline of State Highway Route No. 27. The dam is an overflow-type structure. It is presently used for no purpose.

The structure is of dry stone-masonry construction, about 15 feet high and 48 feet long. On the right abutment is a building used as a machine shop. The left abutment consists of a 4 foot wide dry stone-masonry wall believed to be the corner of a former stone building. The depth from the top of the left abutment to the crest of the dam is 3.25 feet.

For a length of about 25 feet from the right abutment the crest of the spillway is about 10 feet wide. This portion is believed to be the original dam. The remaining length of spillway is possibly the upstream wall of the former building. The remains of the building walls extend downstream from the dam for a distance of about 50 feet. The basement of the building is considerably filled with rock and debris. The pond adjacent to the dam contains a considerable accumulation of silt.

About 30 feet upstream from the dam is the exit of a culvert which extends under State Highway Route No. 27 for a distance of 103 feet. This culvert is made of stone masonry, has vertical side walls, and an arched roof. The opening is 20 feet wide with side walls about 7 feet high to the spring-line of the arch. The arch is about 7.5 feet high.

Conclusions and Recommendations

1. Under present drainage area and reservoir conditions, the spillway capacity of the dam will be exceeded during a Rare Flood as determined by the Kinnison-Colby Formula. About 82 percent of the maximum flood flow would go over the dam and about 18 percent would travel along the railroad to the north of the dam and would emerge downstream from the dam.

2. Stone slope protection should be placed on the bank above the left abutment. This protection may be dumped or hand placed riprap. The stone should be placed from the top of the abutment to about El. 199 and should extend from Route No. 27 to about 25 feet downstream from the dam.

3. The spillway crest should be kept clear of obstructions.

4. Ice and stream flow conditions did not permit a thorough examination of the structure. Another examination should be made during the summer months when the stream flow is low.

5. No alterations should be made to the dam or any of its appurtenant structures without permission from the Middlesex County Commissioners.

Spillway Capacity and Flood Flows

The capacity of the spillway is estimated to be 756 cfs. (cubic feet per second). The tributary drainage area above the dam is 19.2 square miles. The maximum rate of runoff from this drainage area is estimated from the Kinnison-Colby Formula (Rare Floods), exclusive of valley storage effect, as 3,700 cfs.

The Kinnison-Colby Formula (Rare Floods) is as follows:

$$Q = (0.0595S^{1.5} + 342) \frac{M^{0.95}}{L^{0.7}}$$

Q = peak discharge in cfs.

S = Median altitude of drainage area in feet above outlet

M = Drainage area in square miles

L = Average distance in miles which water from runoff uniformly distributed over the drainage basin must travel to outlet.

This formula for Rare Floods has been adopted by the Waterways Division of Massachusetts Department of Public Works and the Massachusetts Turnpike Authority. Inquiry of the U. S. Geological Survey indicates this formula is applicable to the estimation of flood flows in Massachusetts.

Approximately 50 percent of the drainage area is meadow or swampland which furnished storage capacity for runoff from the drainage area. Three features on Fort Pond Brook upstream from the dam would influence the rate of flow over the dam during a flood. The first is the road embankment and culvert at Martin Street about 3,200 feet upstream from the dam. The second is the road embankment and culvert at South Acton Road about 2,600 feet upstream from the dam. The third is the above-mentioned culvert and embankment at Route 27. Due to so much storage effect over the entire drainage area, the runoff from the 8.8 square miles of drainage area immediately upstream from the dam is considered to have the greatest effect on the spillway. The estimated maximum flood flow is 1,200 cfs. Approximately 980 cfs. would go over the dam. The remaining 220 cfs. would flow along the Boston and Maine Railroad to the north of the dam and would emerge downstream from the dam.

#### Stability and Repairs

The stability of the structure is considered adequate. The rock in the basement of the remains of the old building on the left side of the dam should be allowed to remain in order to preserve the stability of the upstream wall. In order to protect the left abutment rock, protection should be

placed on the bank above the left abutment. This protection should extend from the stone retaining wall on the downstream side of Route No. 27 to a distance of approximately 25 feet downstream from the dam. This rock should extend up the bank to approximately El. 199.

The examination of the dam was made under winter conditions and moderate stream flow. In order to obtain a more accurate determination of the condition and cross-section of the dam, another examination should be made during a period of low stream flow in the summer or fall.

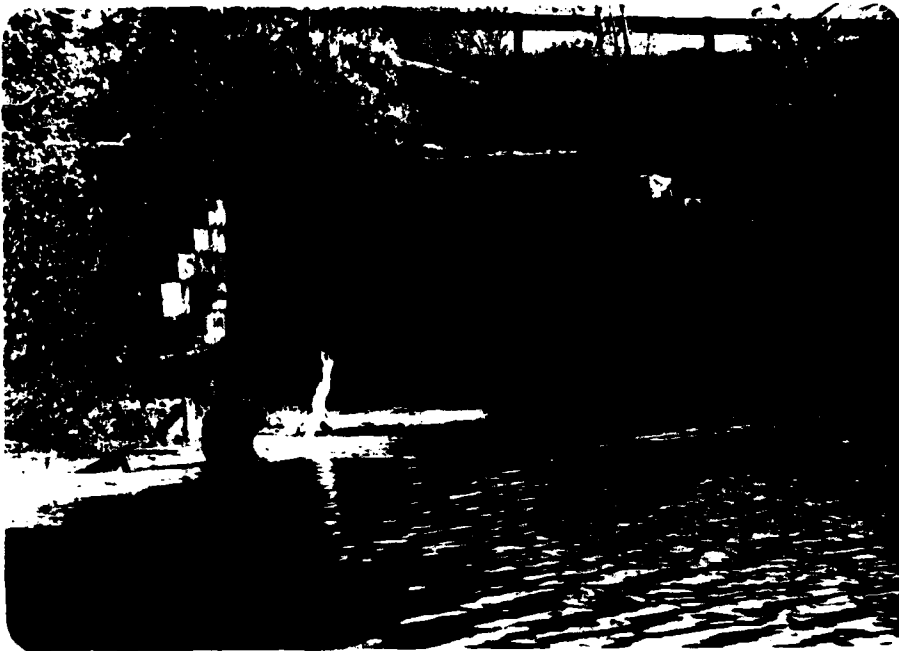
*Gordon E. Thomas*  
Gordon E. Thomas  
Project Engineer



APPENDIX C  
PHOTOGRAPHS

Note: Location and direction of photographs shown on  
Figure B-1 and Figure B-2 in Appendix B.

ERIKSON DAM



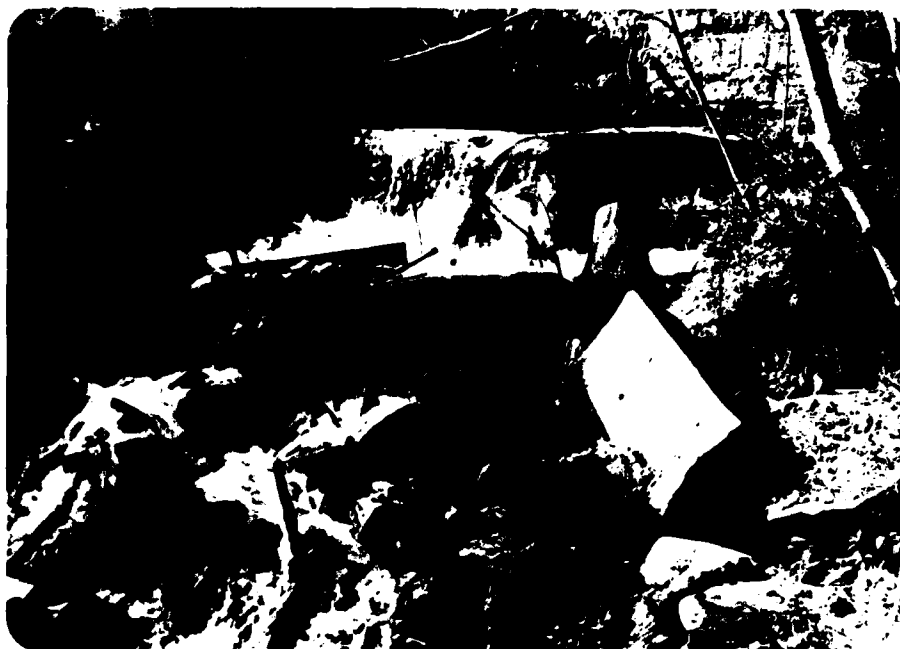
NO. 1 CULVERT UPSTREAM OF DAM



NO. 2 CREST OF SPILLWAY AND DOWNSTREAM CHANNEL



**NO. 3 CREST OF SPILLWAY**



**NO. 4 DEBRIS DOWNSTREAM OF SPILLWAY  
ON NORTH SIDE OF CHANNEL**



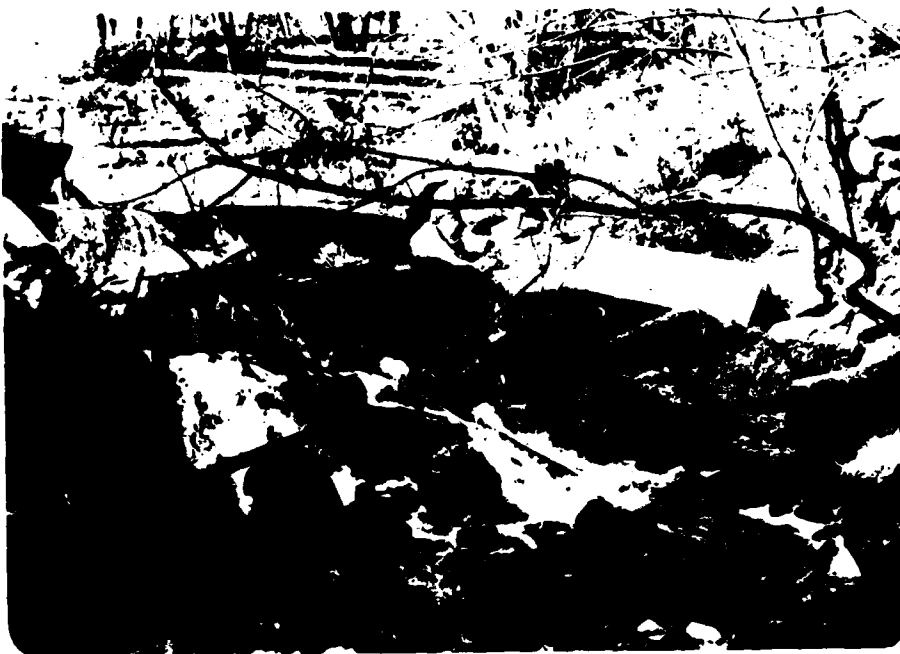
**NO. 5 SOUTH SIDE OF CHANNEL DOWNSTREAM OF SPILLWAY**



**NO. 6 DOWNSTREAM FACE OF SPILLWAY – ABANDONED  
STONE FOUNDATION OF MILL BUILDING**



**NO. 7 DOWNSTREAM CHANNEL AND UPSTREAM CULVERT**



**NO. 8 NORTH ABUTMENT OF DAM AND ABANDONED  
STONE FOUNDATION OF MILL BUILDING**

APPENDIX D  
HYDROLOGIC AND HYDRAULIC  
COMPUTATIONS

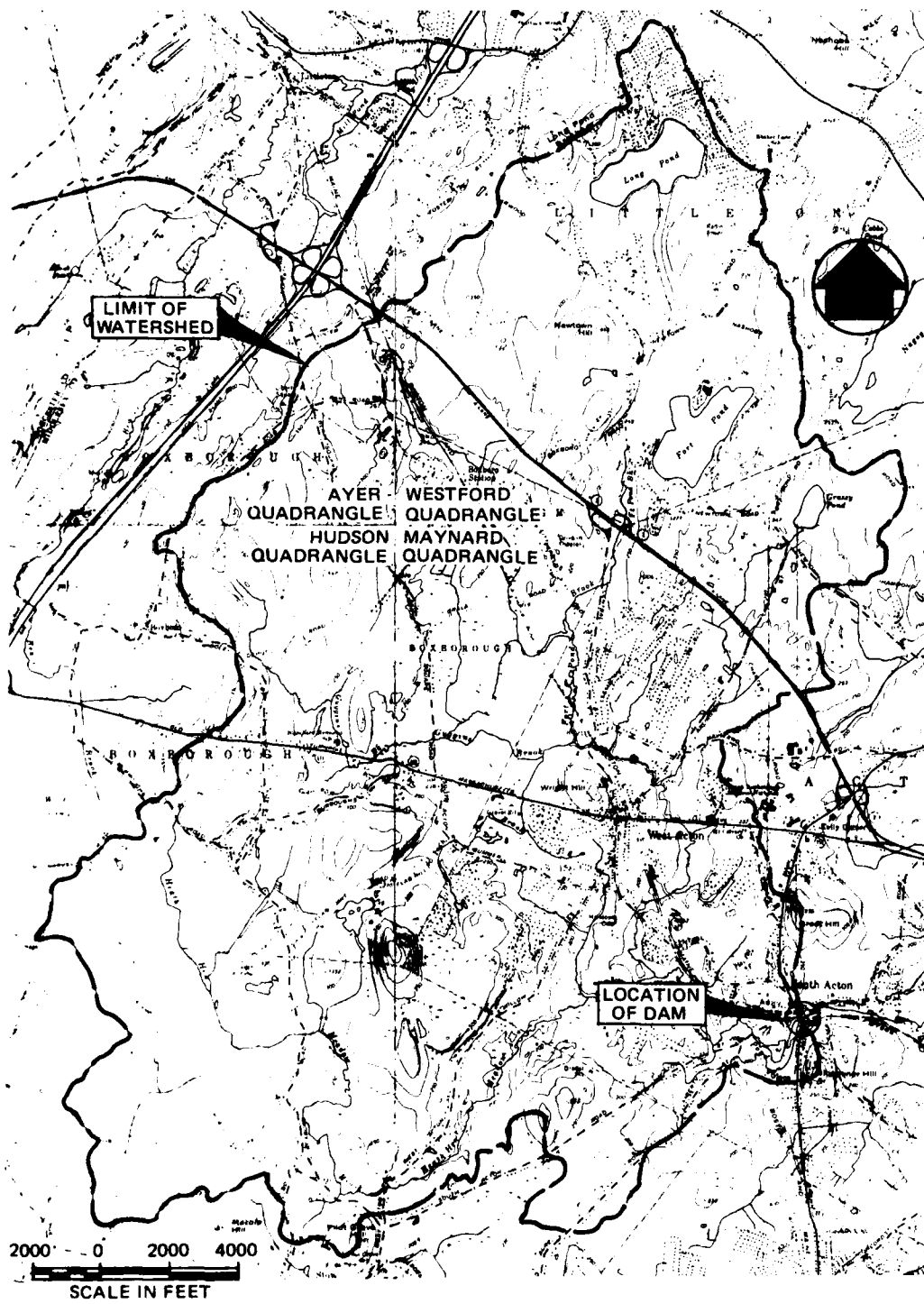
Figure D-1, Drainage Area Map  
Computations

Page

D-1

D-2

ERIKSON DAM



DRAINAGE AREA MAP -- ERIKSON DAM

Project Nat. Review of Non Fed. Dams Acct. No. 6356 Page 1 of 7  
 Subject Middlesex County, Mass. Comptd. By LEB Date 10/18/79  
 Detail ERIKSON DAM Ch'd. By W.C. Date 11/19/79

**I** Test Flood, Storage & Storage Functions

1- Total Drainage Area - 19.58 mi<sup>2</sup>

2- Pond(s) Area:  $.16 + .16 + .01 + .03 = 0.36 \text{ mi}^2$   
 Swamp(s) Area:  $.36 + .26 + .33 + .32 + .36 + .37 = 2.00$   
Total Area Ponds & Swamps: 2.36 mi<sup>2</sup>

% Ponds & Swamps =  $\frac{2.36}{19.58} = 12\%$

3-  $\frac{447-192}{35200} = .00724$

$\frac{410-192}{38600} = .00565$

} Say Ave Slope = 0.65%

4- Using C. of E. Curves for Peak Flow Rates & above guide values the Peak Flow Rate was estimated to be on Flat & Coastal and taken at 650 c.f.s./mi<sup>2</sup>  
 Size Class: Small ; Hazard Pot.: Signif.; Spill. Des. Flood: 100 yr to  $\frac{1}{2}$  PMF  
 Use: Test Flood = 100 yr. flood  $\approx \frac{1}{4}$  PMF

5- Test Flood Inflow =  $\frac{1}{4}(650) 19.58 = 3200 \text{ c.f.s.}$

6- Pond Storage

The pond area is .01 sq. mi. at elev. 192.  
 The storage area increases rapidly with increased depth

7- Spillway crest elev. is 190.3 (low pt. on top of dam)

8- Storage Functions are based on  $Q_{out} = Q_{in} \left[ 1 - \frac{S_{out}}{R} \right]$

$S_{out}$  = Storage Vol. in Reservoir related to final  $Q_{out}$  in terms of inches of rain over the drainage area.

$R = 6 \text{ hr rain of storm}$

9- Storage Functions: (Test Flood &  $\frac{1}{2}$  PMF - if needed)

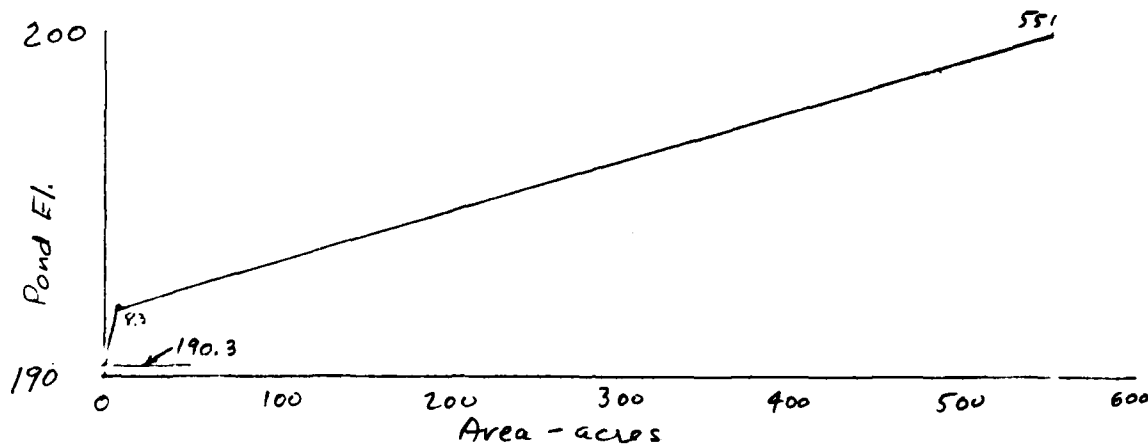
$F_{TF} = 3200 - 673.7 S$  For evaluation of  $S$  see **II**



Project Nat. Review of Non Fed. Dams Acct. No. 6356 Page 2 of 7  
 Subject Middlesex County, Mass. Comptd. By LEB Date 10/18/79  
 Detail ERIKSON DAM Ch'd. By W.C. Date 11/1/79

## II Flood Storage

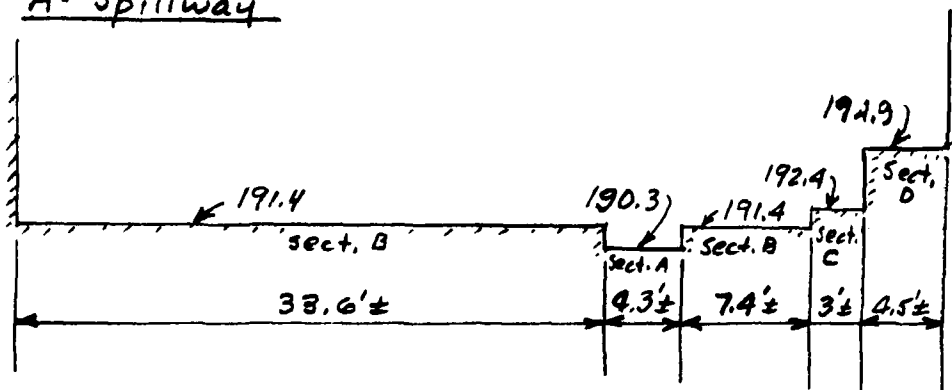
Pond Area = 8.3 acres @ el. 192 & 551 acres @ el. 200



Pond Elev.	Pond Area (acres)	Incr. Storage (ac. ft.)	Total Storage (ac. ft.)	$S = \frac{\text{Total Storage (K)}}{\text{Drainage Area (inches)}}$
190.3	0		0	
192	8.3	7	7	.007
193	76	42	49	.047
194	144	110	159	.152
195	212	178	337	.323
196	280	246	583	.550
197	347	313.5	896.5	.858
198	415	381	1277.5	1.223
199	483	449	1726.5	1.653
200	551	517	2243.5	2.148
201	619	585	2828.5	2.708
202	687	653	3481.5	3.334
203	755	721	4202.5	4.024

### III Discharge Ratings

#### A. Spillway



Crest is ± 4' wide - Use  $q = 3H^{1.5}$

Hdwater El.	193	196	198.8	200	202	201
Q for Sect A	60	180	320	390	520	450
" " B	250	1210	2480	3100	4240	3660
" " C	0	60	150	190	270	230
" " D	—	20	100	160	260	200
<b>Σ Q</b>	<b>310</b>	<b>1470</b>	<b>3050</b>	<b>3840</b>	<b>5290</b>	<b>4540</b>

#### B. Along Railroad

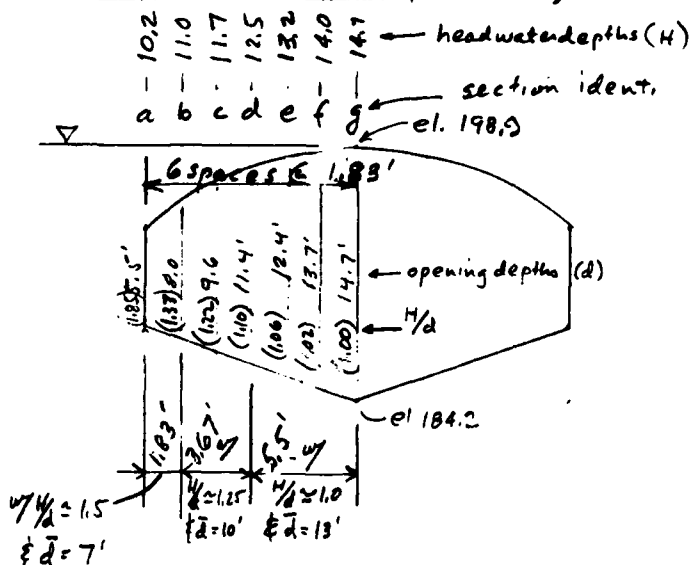
With pond above el. 197.5±, water would pass under South Main St. via a railroad underpass. Just beyond the underpass the flow could rapidly spread and return to the river. Assume discharge rate determined by critical flow at underpass (29'± wide)

$$Q_B = \frac{2}{3} h (29') \sqrt{2gh}^{1/3} = 89.6 h^{3/2} ; h = \text{Pond El.} - 197.5$$

Pond El.	198.8	200	202	201
h	1.3	2.5	4.5	3.5
Q <sub>B</sub>	130	350	860	590

IV

Culvert Capacity w/ Entrance Control  
 (a) Water @ Top of Culvert (el. 198.8)



[Ref. V.T. Chow  
 "Open-Channel  
 Hydraulics"  
 Fig 17-29]

$$\begin{aligned} 5.5' \times 2 \times 150 \text{ cfs/ft} &= 1650 \text{ cfs} \\ 3.67' \times 2 \times 130 &= 954 \\ 1.83' \times 2 \times 90 &= 329 \end{aligned}$$

2933 cfs - w/ Hdwater @ el. 198.8

(b) Water at El. 200

Section:	a	b	c	d	e	f	g
H	11.4	12.2	12.9	13.7	14.4	15.2	15.9
d	5.5	8.0	9.6	11.4	12.4	13.7	14.7
H/d	2.07	1.52	1.34	1.20	1.16	1.11	1.08
	1.83' w/	1.83' w/	3.67' w/	3.67' w/			
	H/d = 2	H/d = 1.5	H/d = 1.25	H/d = 1.0			
	d = 7'	d = 9'	d = 11.3'	d = 13.6'			

$$\begin{aligned} 3.67' \times 2 \times 150 &= 1101 \\ 3.67' \times 2 \times 160 &= 1174 \\ 1.83' \times 2 \times 130 &= 476 \\ 1.83' \times 2 \times 110 &= 403 \end{aligned}$$

3154 cfs - w/ Hdwater @ el 200

IV (Continued)

(c) Water at El. 193

Section	a	b	c	d	e	f	g
H	4.4	5.2	5.9	6.7	7.4	8.2	8.9
d	5.5	8.0	9.6	11.4	12.4	13.7	14.7
H/d	0.8	0.65	0.61	0.59	0.60	0.60	0.60

$1.83' \text{ w/ } H/d = 0.8$      $9.17' \text{ w/ } H/d = 0.6 \text{ \& } \bar{d} = 11.7'$   
 $\bar{d} = 7'$

$$\begin{aligned}
 9.17 \times 2 \times 56 &= 1027 \\
 1.83 \times 2 \times 41 &= 150 \\
 \hline
 &1177 \text{ cfs w/ 4d water @ el 193}
 \end{aligned}$$

(d) Water at El. 196

Section	a	b	c	d	e	f	g
H	7.4	8.2	8.9	9.7	10.4	11.2	11.9
d	5.5	8.0	9.6	11.4	12.4	13.7	14.7
H/d	1.35	1.02	0.93	0.85	0.84	0.82	0.81

$3.67' \text{ w/ } H/d = 1.0$      $3.67' \text{ w/ } H/d = 0.9$      $3.67' \text{ w/ } H/d = 0.8$   
 $\bar{d} = 8'$      $\bar{d} = 11.3$      $\bar{d} = 13.6'$

$$\begin{aligned}
 3.67 \times 2 \times 125 &= 917 \\
 3.67 \times 2 \times 100 &= 734 \\
 3.67 \times 2 \times 70 &= 514 \\
 \hline
 &2165 \text{ cfs w/ H/d water @ El. 196}
 \end{aligned}$$

(e) Water at El. 204

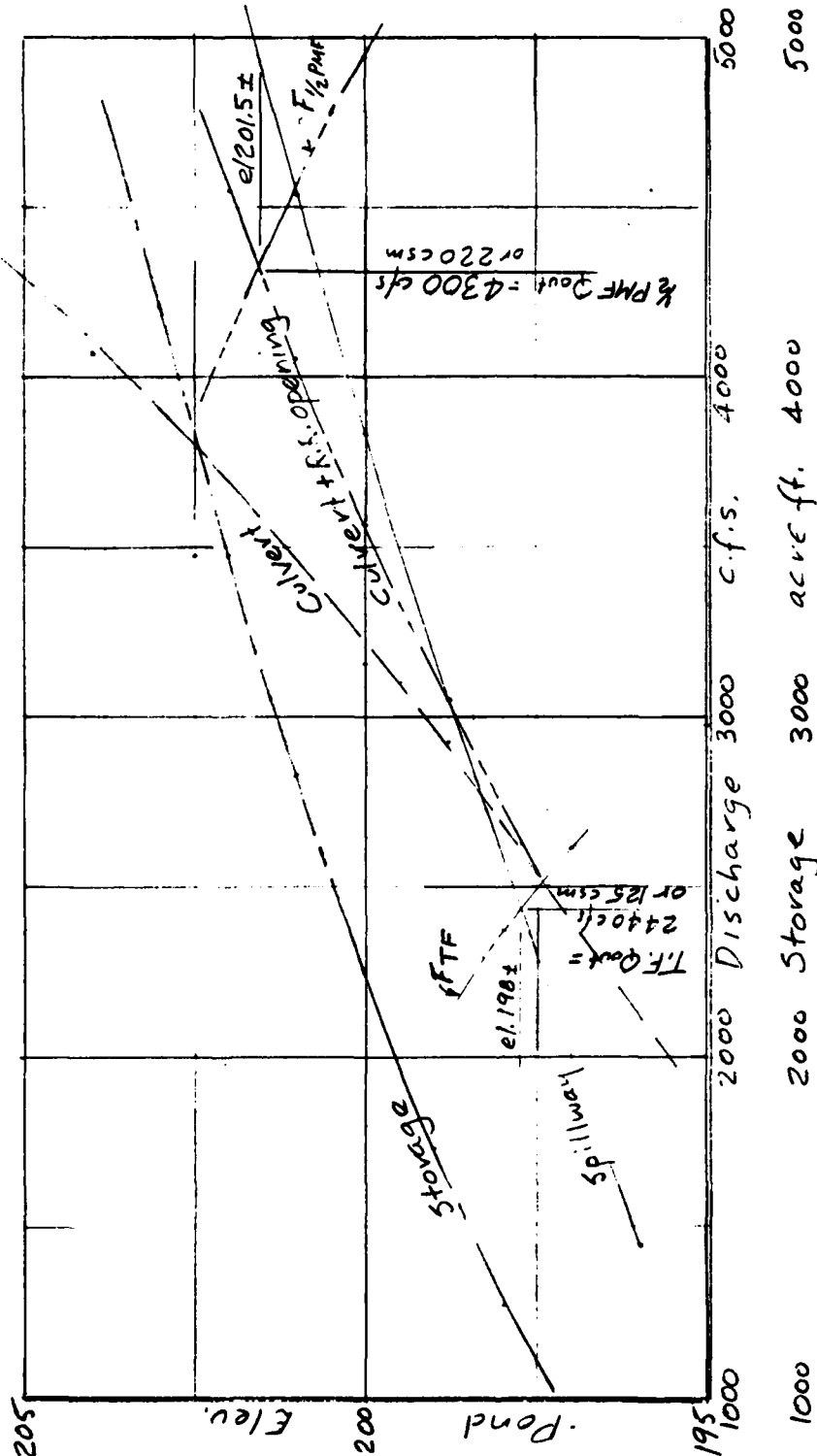
Section	a	b	c	d	e	f	g
H	15.4	16.2	16.9	17.7	18.4	19.2	19.9
d	5.5	8.0	9.6	11.4	12.4	13.7	14.7
H/d	2.8	2.02	1.76	1.55	1.48	1.40	1.35

$3.67' \text{ w/ } H/d = 2$      $7.33' \text{ w/ } H/d = 1.5$   
 $\bar{d} = 8'$      $\bar{d} = 12.4'$

$$\begin{aligned}
 7.33 \times 2 \times 210 &= 3079 \\
 3.67 \times 2 \times 135 &= 991 \\
 \hline
 &4070
 \end{aligned}$$

Project Nat. Review of Non Fed. Dams Acct. No. 6356 Page 6 of 7  
 Subject Middlesex County, Mass Comptd. By LEB Date 10/24/79  
 Detail ERIKSON DAM Ck'd. By WC Date 11/19/79

⑤ Discharge, Storage & Storage Function vs Pond Elevation



D-7

VI

## Failure of Dam

(Note: Crest of dam is all spillway, thus 100yr storm used to set pond elev.)

Peak Failure Flow:

Pond Elevation - 198.0 (Pond el. under  $\pm 100$ yr storm)

Toe Elevation - 178.2

$$Y_0 = 19.8'$$

Dam Length Subject to Breaching = 52.8 (Full Width)

$$W_0 = 40\% (52.8) = 21.1'$$

$$Q_P = 1.68 W_0 (Y_0)^{1.5} = 1.68 (21.1) (19.8)^{1.5} = 3126 \text{ cfs}^*$$

\* Culvert upstream prevents any sustained flow at this rate.

Storage Volume Released: (Between dam & upstr. culvert)

Storage Above Spillway Low Pt.:  $[37(30) + 13(40)] 4.6 = 7498 \text{ ft}^3$

Storage Below Spillway Low Pt.:  $[37(30) + 13(40)] 6\pm = 9780 \text{ "}$

S = Total Storage = 17278 "

## Channel Hydraulics:

If dam failed, discharge is controlled by South Main St. culvert. Loss of the dam with pond elev 198 $\pm$  changes sustained flow from 2440 cfs to 2630 cfs.

About 340 feet downstream from the dam, a stone arch culvert carries a railroad over Fort Pond Brook. This culvert is similar to that just upstr. from the dam - "hydr.'s taken as same.

For dnstr. culvert ent. control:

$Q = 2440 \text{ cfs}$ , depth = 13.6'  $Q = 2630 \text{ cfs}$ , depth = 13.6'

&  $Q = 3126 \text{ cfs}$ , depth = 16.6'

Incr. depth due to water released just behind dam:

$$\frac{17278}{340(30\pm)} = 1.7'$$

Sudden Failure Disch below dnstr. culvert:

Depth = 13.6 + 1.7' = 15.3', &  $Q = 3100 \text{ cfs}$  - rapidly reduces to 2630 cfs.

## Time to Drain:

43560 (1284)

$$\frac{43560}{3600(\frac{1}{2})(2630)} = 11.8 \text{ Hours. (ignoring continued inflow)}$$

APPENDIX E

INFORMATION AS CONTAINED IN THE  
NATIONAL INVENTORY OF DAMS

ERIKSON DAM

## INVENTORY OF DAMS IN THE UNITED STATES

IDENTITY NUMBER	STATE	COUNTY	CITY	COUNTY	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY   MO   YR
MA 195	MA	017	05		ERIKSON DAM	4227.5	7127.3	03DEC79

POPULAR NAME	NAME OF IMPOUNDMENT
	FORT POND BROOK

RECORD NO.	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01 06	FORT POND BROOK	ACTON	0	10210

TYPE OF DAM	YEAR COMPLETED	PURPOSES	HYDRAULIC		IMPOUNDING CAPACITIES	
			HEIGHT (FT.)	WIDTH (FT.)	MAXIMUM	MINIMUM
CIPG	1848	R	17	13	50	50

DIST OWN FED R PRV/PED SCS A VER/DATE  
MED. N N N N

REMARKS
21-DRY STONE MASONRY

D/S HAS	SPILLWAY TYPE	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CUY)	POWER CAPACITY (KW)	NAVIGATION LOCKS	
					WEIR TYPE	NO. OF LOCKS
2	53 U	53	1000	300		

OWNER	ENGINEERING BY	CONSTRUCTION BY
ERIKSON GRAIN MILL INC	UNKNOWN	UNKNOWN

REGULATORY AGENCY	
DESIGN	CONSTRUCTION
NONE	NONE

INSPECTION BY	INSPECTION DATE DAY   MO   YR	AUTHORITY FOR INSPECTION
METCALF AND EDDY INC	10SEP79	PL92-367

REMARKS



**END**

**FILMED**

**7-85**

**DTIC**